International Civil Aviation Organization

The Fifth Meeting of System Wide Information Management Task Force (SWIM TF/5)

Video Tele-conference, 9 – 11 August 2021

Agenda Item 6: Updates on the assigned tasks by task leads/contributors including progress report and issues

d) Governance

SWIM DISCOVERY SERVICE DEMONSTRATION AND LESSONS LEARNED

(Presented by KAC/ROC, USA/FAA)

SUMMARY

The joint USA FAA SWIM and ROK Korea Airport Corporation (KAC) effort to develop SWIM Discovery Service (SDS) supports transparent and replicable discovery of SWIM services in the APAC region.

This Working Paper provides a brief summary of the SDS concept, describes the SDS demonstration environment and scenario, and shares lessons learned from the SDS effort.

1. BACKGROUND

1.1 Service discovery is a critical aspect in Service Oriented Architecture (SOA) and an integral and indispensable part of the development of any service centric system. It enables a common understanding of services deployed in their respective SWIM environments. Discovering SWIM services across geographical and organizational boundaries is challenging as the number of SWIM implementations grows.

1.2 USA FAA SWIM and ROK KAC have been working together since October 2019 to develop and refine the SDS specification [1]. The first version of an SDS specification was published in July 2020, and the SDS specification and related WP/IPs were presented at the SWIM/TF4 meeting [2].

1.3 Following the SDS specification, co-leader states of the governance task have been conducting implementation of an SDS instance as one of the sub-modules on their respective registries, the FAA NAS Service Registry/Repository (NSRR) (operational) and the KAC SWIM Registry (R&D) as shown in Figure 1.

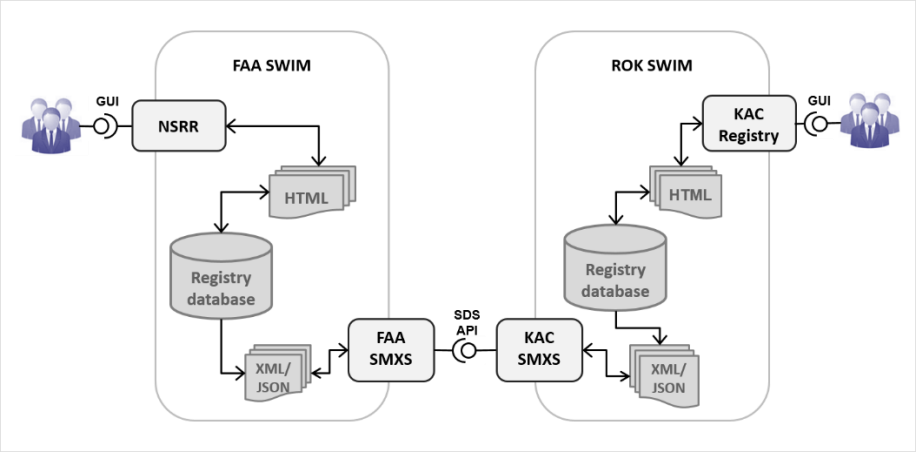

Figure 1 SDS Implementation

2. SDS INTRODUCTION

2.1 SDS provides service meta-information. It is loosely-coupled, interoperable, autonomous, reusable, and discoverable. The goals of SDS are as follows:

- To enable service discovery among independently developed and autonomously managed SWIM domains;
- To allow a user to obtain service metadata from multiple sources simultaneously in a single, consolidated, semantically consistent result; and
- To avoid reliance on a single centralized discovery mechanism by allowing a discovery service to describe itself and other discovery services.

2.2 SDS supports Point-to-Point (P2P) discovery. Every individual discovery service (DS) ("peer") is an equally privileged, equipotent participant with the same capabilities and responsibilities, and a DS is based REST web service architecture [3] and described using OpenAPI [4].

2.3 SDS uses standard HTTP methods to access and/or manipulate service description resources. Currently SDS only supports the return of information represented by a resource using the GET HTTP method. SDS defines four resources as follows:

- discovery service (`/discovery-service`): a resource that allows a requestor to retrieve a description of a particular DS;
- peers (`/peers`): a resource that allows a requestor to retrieve a collection of references to peer DSs;
- services (`/services`): a resource that allows a requestor to retrieve a collection of references to SWIM services that meet the requestor's search criteria;
- service (`/services/{service-id}`): a resource that allows a requestor to retrieve information about a specific SWIM service.

3. DEMONSTRATION

3.1 From the technical perspective, there are two SDS instances respectively developed by FAA and KAC. Both provide all resources of SDS defined in the specification:

- FAA SWIM Metadata Exchange Service (SMXS) [5]; and
- KAC SWIM Metadata Exchange Service (SMXS) [6];

3.2 From the operational perspective, FAA and KAC are incorporating cross registry search capabilities into their service registries (i.e., NSRR and KAC SWIM Registry), as shown in Figure 2 and Figure 3.

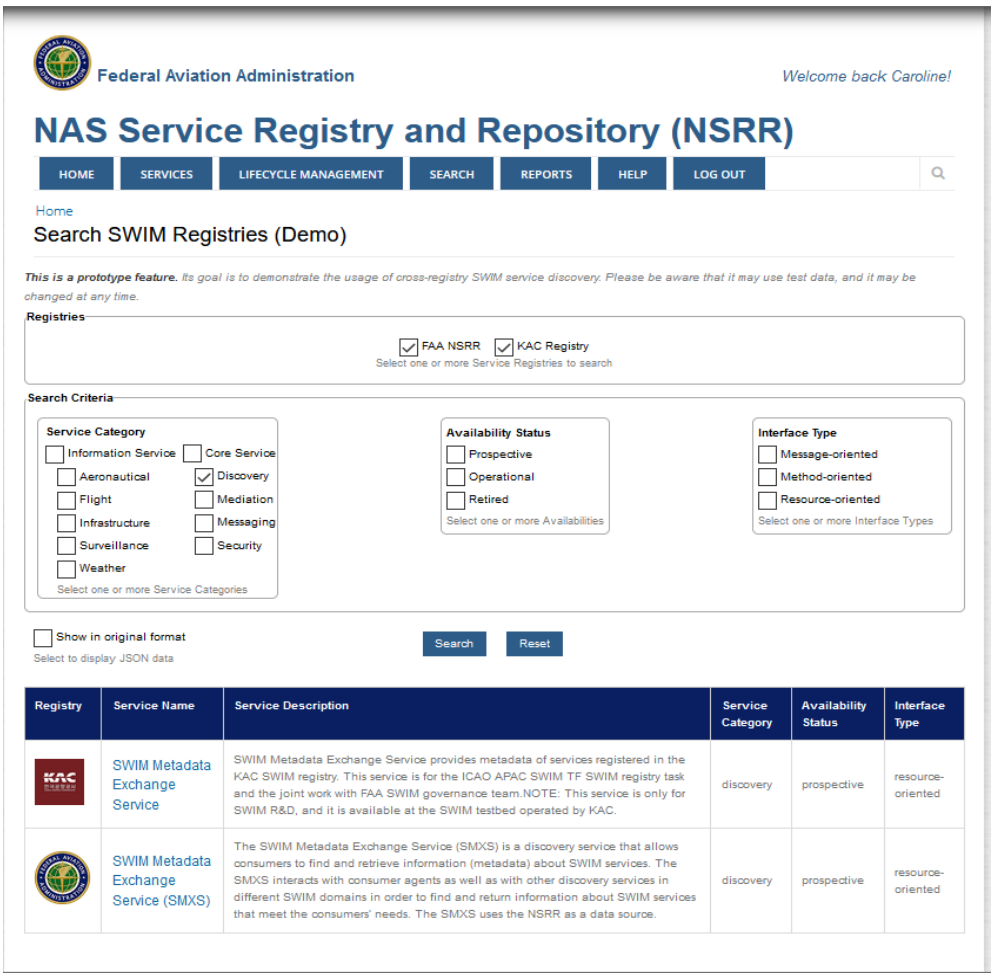

Figure 2 NSRR Cross Registry Search Module

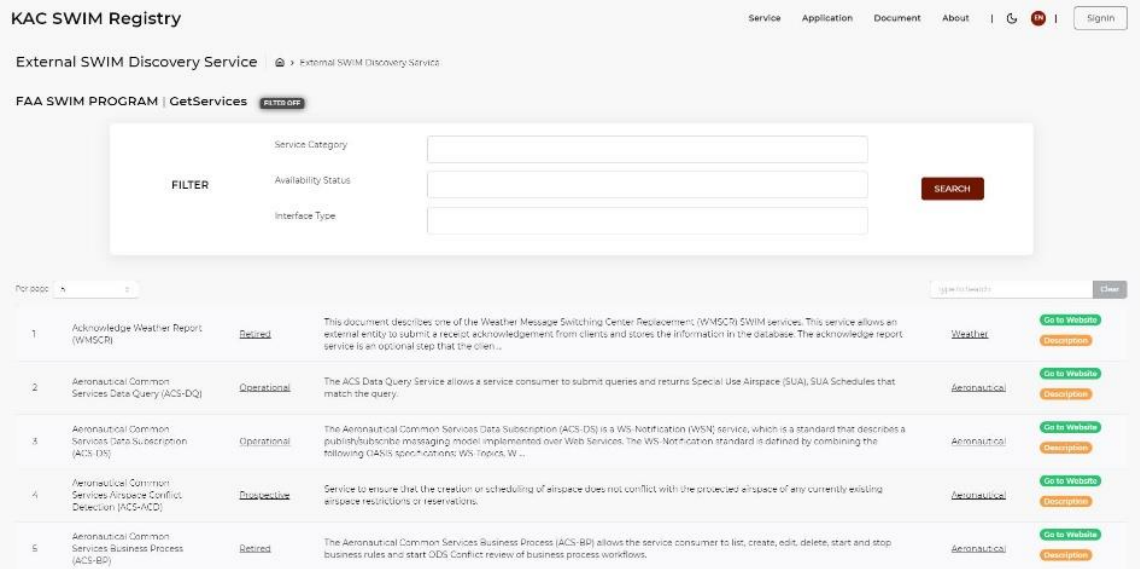

Figure 3 KAC Cross Registry Search

3.3 Each DS instance only communicates with another DS, not a service registry. Once a user clicks a search button on a cross registry search page, it first sends a GET request to its own DS instance and the DS instance re-routes a request to the destination DS, and then the DS returns a consolidated query result to the user. (See Figure 4)

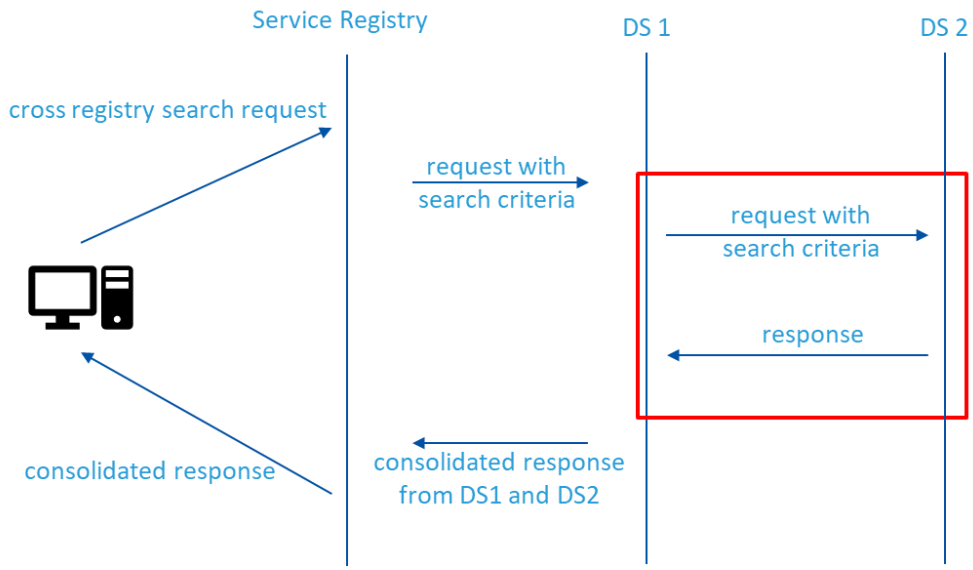

Figure 4 Demonstration Scenario

3.4 More information is provided during the demonstration. (See attachment A)

4. LESSONS LEARNED

4.1 OpenAPI provides a developer-friendly environment in which a developer can easily implement and test the SDS following the OpenAPI specification.

4.2 Implementation of SDS decouples Graphical User Interface (GUI) from web services. This means it does not require changes to the registry interface and business operation.

4.3 Common taxonomies (e.g., service category, availability status, interface type) would improve interoperability by helping users to discover and understand service metadata obtained from another registry. [7]

5. ACTION BY THE MEETING

5.1 The meeting is invited to:

a) note the information contained in this paper; and
b) discuss any relevant matter as appropriate.

REFERENCES

[1] https://discovery.swim.aero/sds/1.0.0/SDS%20Specification%20v.1.0.0.pdf
[2] FAA, KAC, “SWIM Discovery Service (SDS): Introduction”, APAC SWIM TF/4, November 2020
[3] Fielding, Roy Thomas. "REST: architectural styles and the design of network-based software architectures." Doctoral dissertation, University of California (2000).
[4] https://swagger.io/specification/
[5] https://nsrr.faa.gov/services/smxs
[6] http://112.172.247.116:8000/
[7] https://semantics.aero/